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Drivers and Barriers of Mobility-as-a-Service in urban areas

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Abstract

Around 70% of world population will be living in urban areas by year 2050. Therefore, urban transport providers need to be more efficient and innovative to be able to cope with the large demand. The concept of Mobility-as-a-Service (MaaS) is an innovative approach that can potentially offer a way forward to deal with this demand in urban areas in future. In this paper, we discuss expected positive outcomes, drivers and barriers of MaaS. We provide two national case studies from the Netherlands and Germany to put the mentioned drivers and barriers into perspective. Finally, we provide some food-for-thought and action points for decision makers in transport regarding the arrival of MaaS and preparing the transport sector in anticipation of the large urban mobility demand.

Keywords: New mobility, Mobility-as-a-Service, drivers and barriers, transport policy

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1. Introduction

In the middle of the 20th century, 70% of the population lived in rural areas. However, at the turn of the century, half of the world population had settled in urban areas. This trend is expected to continue. In 2050, approximately 70% of the global population will be living in urban areas (Stevenson & Gleeson, 2019). Consequently, transport providers need to become highly efficient and innovative in delivering the ever increasing demand for mobility in the urban environment.

In addition to large urban demand, consumers are better connected and informed about alternative service providers, thanks to the digital revolution (e.g. IoT, 4G/5G networks, artificial intelligence etc.). Consumers can also easily share experiences with each other on social platforms about the quality of transport services they receive. Therefore, transport providers need to offer high quality and tailored services for movement of people and goods in order to be competitive. In coming years, we expect that transport services companies need to offer their services in such a manner that it covers the following: 1) what users want, 2) when users need it and 3) where users prefer to receive it (Westermann, 2018). This is where the concept of Mobility-as-a-Service (MaaS) comes into play.

MaaS is a relatively new concept and has the potential to impact the transport sector similarly to the ways Netflix has impacted traditional media or Amazon (or other online retailers) has impacted traditional street shopping. It offers transport users access to a range of modes and travel experiences, which can be easily accessed from users' smart phones or tablets etc. MaaS envisions a shift from the current dominant transport model, being individuals moving primarily in privately owned vehicles, towards a model where users have a range of travel services they can use as needed. These travel services are often on-demand, do not require user ownership of any transportation mode, and can be mixed within any single trip. It is a shift from mobility as a commodity ('I purchase a vehicle to move around') to mobility as a service ('I purchase a ride to move around').

According to above vision of MaaS, it is expected to potentially change current travel behavior of users and, depending which modes are promoted, could be an avenue towards reducing the use of private cars (Datson, 2016). However, the existing experience, from mainly US based transit network companies (TNC's like Uber and Lyft), have only increased car use in urban areas (Schaller, 2018). Nevertheless, the reduction in car ownership and use seems to be the ultimate motivation for implementing MaaS in polluted and congested metropolitan areas.

MaaS is made up of two components: a) new mobility modes, such as: bike-sharing, scooter-sharing, ride-hailing, micro-transit, and carsharing next to the existing transport modes, and b) new mobility platforms, where a single app is used to connect users with transport providers. The platform can have multiple functionalities including a routing tool, determination of the costs, offering the mobility options, booking and payment of service (Westermann, 2018).

At the moment, most MaaS projects are in pilot phases with many uncertainties circulating around them. It is yet uncertain "how the MaaS marketplace will develop; MaaS offerings may take many forms and be marketed to different types of customers" (Datson, 2016). Behavioral economists in transport believe that users may "overvalue current [transport] benefits and undervalue potential gains [from MaaS], resulting in a status quo bias, which means attracting enough customers to a new type of mobility service will be a challenge" (Lund et al. et al., 2017). This is why it is important to effectively study MaaS and its impact on current transport.

Even though the full impact of MaaS on the current transport system is unknown, it is thought to be potentially disruptive and it is expected to play a large role. To shed more light on this important topic, in this paper, we have put together the essence of over 15 extensive interviews with experts from public and private parties (TNO, 2019), workshops with industrial partners and the in-house knowledge developed on the subject of MaaS. We aim to position this paper in transport policy discourse and provide a source of input for decision makers.

In this paper, we focus on how MaaS is expected to evolve in upcoming years and what factors may contribute to its successful deployment. Due to the still limited literature on perceived barriers and drivers for MaaS (Lyons et al. 2019), we elaborate on these factors from the transport policy perspective. We conclude by providing two national case studies about the recent developments of MaaS and then elaborate on what decision makers need to consider when it comes to prepare the market for this potential radical phenomenon.

2. Evolution of MaaS and some key success factors

2.1. Evolution stages of MaaS

Transport experts have been discussing MaaS and the associated new mobility concepts in earnest since 2015. Meanwhile, this concept is being tested and further developed. Experts believe MaaS will advance and evolve through the following stages (Westermann, 2018):

- Stage 0 : individual and independent mobility mode offerings, i.e. no integration.
- Stage 1 : multimodal route planner and price comparison services i.e. some sort of integration in data
- Stage 2 : inclusion of booking and payment capabilities into route planner
- Stage 3 : increasing service providers and offering multi-modal options to users
- Stage 4 : integrating public and private transport providers into one platform

Alternatively, MaaS is being deployed in world in different ways:

- Private based MaaS: where MaaS is being developed and marketed by the private companies. A large set of companies from Uber to (semi private) Dutch railways (NS), who are developing MaaS platforms. Some platforms are open for others to join and some of them are not. Surprisingly, the MaaS platform offered by the Dutch railways is a closed version.
- Public based MaaS: where the city authorities or municipalities try to setup a MaaS platform to initiate and to stimulate the development of MaaS. The main aim is to utilize the resources of mobility providers to serve remote urban areas, where deploying conventional public transport services is costly.

As of mid-2019, various pilots have been established throughout the EU to implement different versions of MaaS. The main purpose is to experience its impact on the current transport system and assess possible disruption and/or gains. Some pilots are governmental/publicly funded or subsidized by the EU commission and some are initiated by the private sector. The latter are not seen as distinct projects (with a certain end date) but rather as entrepreneurial attempts to create a new revenue stream from the new mobility concepts and to develop them into a sustainable business case. The following are a few EU based examples of MaaS:

- whim (initiated in Finland, now expanded globally),
- Trafi (initiated in UK, platform provider)
- UbiGo (Sweden, Gothenburg),
- WienMobil (Austria, Vienna),
- Travelspirit (UK, Manchester),
- FÖLI+TUUP (Finland, Turku),
- Jelbi (Germany, Berlin) [as of summer 2019]

2.2. Expected positive outcomes of MaaS in urban areas

If MaaS is successfully deployed, we expect several positive outcomes. We aim to list a few of these outcomes.

2.2.1. On the supply side

MaaS programs should ideally stimulate the *willingness to cooperate among competing* transport providers (Westermann,2018). It is costly to develop a standard and user-friendly platform. However, if competitors agree to offer their services on a common platform, it can provide a mutual benefit and can enable the successful launch of MaaS.

The more common model we are seeing in the US is a competitive market where a company tries to align (or outright own) various mobility services and puts them into a MaaS platform that competes with others. Uber and Lyft are the key examples of this with their development of shared rides (microtransit) and acquisitions and partnerships with bikeshare and scooter share companies.

When sharing a common platform, there also needs to be a *good trustworthy relationship with all partners*. These partners are not just transport providers but software developers, communication companies, local authorities, infrastructure providers etc. Furthermore, the common platform which is at the heart of any MaaS platform needs to be handled by a *neutral and trustworthy mediator of the common platform* (Westermann,2018). Any opportunistic behavior or mishandling of the corporate data or lack of protecting users' personal and travel data puts the fate of MaaS in jeopardy.

MaaS needs to provide *alternative modes* to cover diverse preferences and income groups among users. Availability of alternative modes at each stage of the trip needs to be accompanied by *easy switching between modes* for more convenience. Providing the necessary infrastructure for bike-, ride- and carsharing in the vicinity of transport hubs is thought to be encouraging further uptake of MaaS (Franckx, 2015).

2.2.2. On the demand side

Nowadays, transport users are increasingly demanding faster, more frequent and diverse means of transport. MaaS needs to provide *fast, accurate and real-time support* for these travelers. Customer loyalty is necessary for any new and innovative system to take off. MaaS needs to provide *user confidence as well as rating and feedback systems.* Feedback systems can play a decisive role in attracting and keeping new customers. These systems are well established with lodging service providers such as AirBnB or Booking.com, where fellow users provide detailed descriptions of their experience and rate the services and facilities.

Clear and simple contract types are highly important for users. It is thought that *Pay-as-you-go type contracts* would be more popular among MaaS customers (Laurell,2017), but it does have its own risks for the transport providers.

3. What are drivers for MaaS?

3.1. Push from municipalities or city authorities

Several drivers are facilitating the actualization of MaaS in urban areas. MaaS may help to reduce congestion by making more users switch to public transport or shared mobility services such as car sharing or bike sharing. It may even alleviate the need for car ownership and hence imply less demand for parking space in the populated inner city areas (Lund et al., 2017). These parking spaces can be converted to green areas or bike sharing docks among many other options.

MaaS may have direct impact on the pollution levels of urban areas and indirect impact on climate change and the energy transition. If MaaS is mostly developed and run by TNC's, then MaaS may increase car use in urban areas and cause more congestion and pollution. If MaaS is mostly based on public transport, then it will reduce car use and consequently reduce emission in urban areas. Therefore, cities see MaaS as a potential solution to some of their transport problems meanwhile they must be aware of the negative path that MaaS can take. It is important for authorities to try to steer the development of the MaaS towards more public transit based MaaS.

Increasing costs of car ownership and parking costs (especially in the dense urban areas) is already encouraging some urban dwellers to shift to car sharing or ridesharing. If public policy makers aim for keeping public transport as the back bone of the MaaS and encourage new mobility services to feed to urban public transport hubs, then car ownership in metropolitan areas would be less and less attractive.

Cities have the opportunity to develop MaaS in a way that their current transport system can be utilized more efficiently (Finger et al, 2015). For instance, by prioritizing public transport in MaaS platforms or providing support for private mobility services to cover less dense suburban areas. In this was the public transport can be pulled out of less efficient areas and added to more highly utilized areas. This would be more economical and require less subsidies from municipalities or local governments.

MaaS could integrate the fully subsidized transportation (e.g. school transportation) and social service transportation (e.g. for elderly or disabled) imposed by law (König et al., 2016). Managing and planning such

services via MaaS platform, could significantly cut costs for municipalities. This is more important for rural areas than urban areas.

3.2. Push from the private sector

Private transport service providers such as Uber see MaaS as an opportunity to open new markets (e.g. Uber promoting scooters). There are ample business opportunities through collaboration between new startups that are mainly developing new modes (such as e-scooters or automated vehicles etc.) and current transport providers. These two parties can join forces and synchronize their services and share benefits by increasing each other's customers.

Some authors (e.g. Trafikanalys, 2016; Kessler and Stephan, 2013) have reported that car manufacturers are contributing to MaaS by promoting car-sharing. They aim to open up new markets by joining such platforms. Currently, carmakers are scrambling to produce more models of electric and automated vehicles. These vehicles are relatively expensive compared to average combustion engine vehicles. Car-sharing via MaaS can be a good opportunity for car manufacturers to expose their new innovative models to consumers, and connect with users from lower income groups.

In the current world of fast evolving technologies, there is a general interest in innovation, from electronics to clothing, house appliances, and even utilities. Innovative ways of being mobile (new modes) can generate interest among (mainly) young urban dwellers. The apatite to try new innovations by the young generation and to keep up with the technological advances could be a driver for the uptake of MaaS.

Some cities such as Rome, Amsterdam, and Paris have already started in providing open access data on transport (Ambrosino et al., 2016). If MaaS data is allowed to be publicly available (given, the privacy issues are taken into consideration), then access to such data might enable new innovative business ideas in transportation to emerge. The businesses emerging from MaaS data will in turn have a reinforcing effect on MaaS itself.

3.3. Opportunities/threats of disruption of status quo

Public transport providers can use their market position and infrastructure to promote MaaS. The German railway for example promotes bike and car sharing. However, there remains uncertainties about rules and regulations on how far they can proceed with such kind of business opportunities. These legally undefined territories can be both opportunity and barrier for MaaS (Lund et al., 2017). This will be further discussed in the following section.

4. What are barriers for MaaS?

4.1. Public sector barriers

Robust and existing public transit systems may create entry barriers for new startups or competitors to join potential MaaS platforms. These players might resist entry due to fear of losing segments of their market. Some have virtual monopolies in transportation or transport related data (e.g. OV-Chipkaart payment card in the Netherlands). If one looks to the recently announced MaaS tender by the national Dutch railways (NS) and three regional transport operators (GVB, RET and HTM; together responsible for a significant share of the total public transport in The Netherlands), it can be seen that they assume a tremendous amount of control for the partner companies (control all data and who gets access to the platform). Hence, they are looking at MaaS as a reason to extending their powerful position in the market and perhaps even establish a monopoly position.

We should emphasis on the importance of transport data, as it is the building block for a MaaS platform. In the case of the Netherlands, it takes 6-9 months for a new company to be brought on to the OV-Chipkaart system at considerable costs. This barrier to entry limits OV's future use for MaaS (TNO, 2019). The required MaaS data includes ticketing and billing, which need to be interoperable in order to create one common platform (Mulley et al., 2018). This is even more critical when the trip needs to be broken down into the single stages in case of intermodal travel. In this regard, the business models applied to MaaS are still to be found (Sarasini et al., 2017). Moreover, the framework and distribution of roles within a commonly organized MaaS platform is still being discussed and not defined yet (Smith et al., 2018).

Cities require some new infrastructure for bike-sharing, car-sharing, charging stations for electric vehicles, as well as parking spots and modifications of the infrastructure for autonomous vehicles. These infrastructure are often required around main train stations, bus hubs or popular touristic areas. It is highly costly to set up new infrastructure in such places, where land is expensive and not readily available, especially in dense urban areas. These hardware requirements could be potential barriers for MaaS and needs to be provided by the city authorities.

Institutional barriers from authorities

Local authorities or municipalities can create barriers for MaaS. They may set contradictory policies, for instance promoting car-sharing via MaaS, which would increase car presence in busy areas around train stations and bus stations, but not allowing dedicated parking spots or introduce curbside access limitations.

Local authorities might introduce favorable regulations for existing taxi companies at expense of ridesharing services that come with MaaS.

In some countries, public financing is not allowed after a pilot project is completed, even if the pilot is successful (Lund et al., 2017). This would leave startups in a vulnerable position at their infancy stages, where they need financial support to become self-sustaining.

There are safety issues with the new and untested mobility technologies. Accidents with new modes can put their future in jeopardy. Therefore, regulators will take their time before they approve new modes to be rolled out within MaaS system.

4.2. Private sector barriers

Participation of the private sector within MaaS could be a reason for concern. These private companies do not always oblige themselves to provide the services at all times. They may opt for canceling services to some urban areas, if they are not profitable. MaaS needs to assure its customers that it can cover all urban areas in order to be relevant for users.

If MaaS is developed mainly by TNC's then car share may be increasing in urban areas and may alarm the city authorizes to oppose MaaS development. TNC's may also act as monopoly and provide barrier for entry or simply buyout any competition (examples of Uber and Lyft).

Moreover, there is the possible risk of market shifting or changes to the business model that may lead to leaving this entire industry due to future transportation provision (TNO, 2019). This adds to the vulnerabilities that private sector may cause when joining MaaS.

For users it is highly important to trust the private transport providers regarding the handling of sensitive data (e.g. Uber experienced a bad early reputation due to aggressive moves in the Netherlands or leak of private data).

4.3. Demand uncertainty

MaaS offers relatively new modes for consumers. The lack of consumer knowledge/resistance to new alternative modes might hamper the development of MaaS. It is hard to believe markets would see MaaS in a positive light immediately and this would cause concerns for private investors. The untested business models may seem too risky for private transport providers and may not be willing to join without some sort of support mechanism in place form authorities.

As MaaS usually works as a digital solution via smartphones, users need to register to the service in order to be able to use it (Lyons et al., 2019). This can be seen as barrier for potential users since they might not be used to do so (e.g. they formerly just entered the bus and paid at the driver) or because they are in any way restricted in using digital services only (e.g. due to blindness). So there must be taken care of designing inclusive solutions which can be used by all people.

5. National case studies

The enumeration of drivers and barriers to new mobility services above is extensive. While a look across the Atlantic gives an imagination how dynamically transportation network companies like Uber and Lyft may develop, forecasts of market developments in the strongly regulated European markets are way more uncertain. Moreover, European member states may follow different philosophies in promoting new services versus protecting public transport, labor markets or urban fabric.
In this section, we therefore take a closer look into the European mobility markets by focusing on two countries as case studies, namely: the Netherlands and Germany.

5.1. The Netherlands

Currently mobility in the Netherlands is characterized by the traditional modes of transport with a relatively high share for public transport and active modes, i.e. walking and biking. The availability of new mobility services is limited. Ride hailing is highly regulated as only professional drivers are allowed to offer these services. Although micro-mobility companies filed for permits and the regulatory process has started, they are still forbidden for use on public roads. However, the Dutch Ministry of Infrastructure and Water Management have joined forces with regional authorities to change this and will invest 20 million Euros in MaaS pilot projects in the coming years.

The approach chosen by the ministry has the follow characteristics[2]:

- Seven regional pilots to be implemented in Rotterdam, Amsterdam, Eindhoven, Limburg, Groningen/Drenthe, Twente and Utrecht/Leidsche Rijn. All these areas can be categorized by densely populated urban areas.
- Duration of the pilots are two to three years.
- Pilots start regionally yet the idea is to work towards a national roll-out.
- The ministry and the regions co-finance the start-up costs of the MaaS services offered in the pilots.
- Primary driver of the pilot is the MaaS platform providers and, through them, the organization of transportation service providers.
- A joint learning process between transport companies, MaaS services providers and governments is a central element in the approach.
- Sharing of data is required.
- In December 2018, the tender process for the Framework Agreement of the seven regional pilots was completed. In total 41 parties have shown their interest and 24 tenderers have been admitted to the Framework Agreement, allowing those parties to subscribe for the tenders for the regional pilots.

The Dutch regional approach is characterized by a wide variety of pilots, namely:

- travelers and employees of Rotterdam-The Hague Airport (location: Rotterdam),
- the Zuidas business district in Amsterdam where large scale (road) construction works takes place in the upcoming years (location: Amsterdam),
- sustainable and CO2 emission free mobility (location: Eindhoven),
- removing barriers from cross boarder transport (location: Limburg),
- accessibility of rural areas including offering mobility options for specific user groups (school students, elderly and disabled people; location: Groningen/Drenthe),
- participation of all inhabitants by the integration of transport services for specific user groups and regular transportation (location: Twente), and
- large scale growth of housing in the relatively new housing district characterized by high car ownership and use (location: Utrecht-Leidsche Rijn).

[2] Sources:
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https://www.rijksoverheid.nl/documenten/brochures/2018/06/25/mobilty-as-a-service---regionale-pilots
https://dutchmobilityinnovations.com/spaces/1105/maas-regional-pilots/files/25190/letter-to-parliament-on-awarding-of-maas-pilots-framework-contract-docx

As the regional pilots are in the process of starting up and defining themselves, it is not yet certain which specific MaaS services will be offered. Hence, it is not clear how innovative the services will be (e.g. to which extent they will move beyond the more traditional mobility management services), what range of transportation services (carshare, rideshare, transit, microtransit, micromobility) will be included, what their scaling-up potential is, if the involved companies will actually share the data (although they signed a contract that they will, previous public-private partnerships showed many hurdles still need to be overcome before governments actually receive data that they can be used for managing their societal objectives), how the pilots will contribute to the societal goals and what the societal impacts will be.

One of the interesting results so far is that the contracted parties consist of a wide range of different stakeholders: IT companies, start-ups of multinational banks/insurers/automotive and public transport parties. This shows that future mobility services will no longer (only) be the realm of the traditional public transport companies together with governments orchestrating what services will be offered.

The aim is that the consortia that eventually will be formed will have the capabilities of fulfilling the MaaS vision of an integrated platform, offering a wide range of new and traditional mobility services to travelers via integrated apps.

As the Netherlands have a strong culture in public-private cooperation, the process currently followed is still in the making in order to design a system that can yield benefits for both companies and governments. Furthermore, it shall have the potential to become one of the front-runners in the field of MaaS. Yet, it remains to be seen how this process will be managed, how it will develop and what the eventual impacts will be.

5.2. Germany

Mobility services in German cities are only permitted under an experimental clause of the public transportation act (Personenbeförderungsgesetz). This holds even true for non-bus or rail based services offered by local transportation authorities. Under this act, ridesharing services are obliged to return to their base when running without passengers. This is particularly problematic for advanced initiatives like CleverShutte, who are solely running with electric or fuel cell cars. The cities have, however, a high degree of freedom in permitting experimental services, which makes Germany itself a heterogeneous market. Examples for services that have recently been implemented in Germany are:

- Berlin: BerlKönig is organized by the Berlin Transport Authority (BVG) and is operated by Via Transportation, a company of the Daimler Group. BerlKönig runs 90 minivans (as of January 2019). The service covers a rather limited inner-city area with point-to-point services. A direct connection to the public transport system is not obvious. BerlKönig has almost doubled its fleet within a year from 2018 (50 vehicles) to 2019 (90 vehicles). A further expansion towards 300 vehicles is planned when the project proofs to be successful (BVG, 2018). These vehicles are planned to be electric compared to the status quo which shows a mixture of combustion and electric engines. Furthermore, BVG and Trafi cooperate in order to create a MaaS-platform for Berlin called Jelbi (Trafi, 2019). In doing so, they connect all the major mobility providers in Berlin into one App which enables seamless multimodal travel from real-time routing to purchase.
- Next to BerlKönig, Berlin also hosts CleverShuttle which is not bound to any transport authority, and hence offers its services in Leipzig, Munich, Hamburg, Stuttgart, and Kiel as well. They operate a fleet consisting of battery electric (>120 vehicles) and fuel cell (55) vehicles and are therefore locally emission free (CleverShuttle, 2019).
- Hamburg: HansaTaxi is operated by the taxi operator in Hamburg which makes it a good example how taxi services can enrich their business model to the new mobility concepts. This is in order not to let competition grow next to the strongly regulated taxi market, but to keep control over competing mobility services. Moreover, ioki works im Hamburg as a cooperation between the German railway provider Deutsche Bahn and the local transport authority Hamburg-Holstein. They started with 20 electric vehicles and are integrated into the public transport network. This means for example that when a train ticket includes the city-option (which the standard fare tickets for long distance trains usually do) or the user already purchased a usual public transit ticket, ioki is included in the ticket except for the usual surcharge of 1 € (VHH, 2019).

- Duisburg: MyBus, operated by Door-to-Door, currently operates at weekends in more remote areas only. MyBus thus clearly supports public transport where its offer cannot be as dense as in central areas of the city.

The list of cases in Germany shows a scattered picture. There are no national attempts visible to implement national MaaS systems. However, local transport providers such as BVG in Berlin begin to think in MaaS platform solutions. The Ministry for Transport and digital Infrastructures (BMVI) currently investigates the mode shift and climate mitigation potentials (or risks) of new mobility services throughout its Mobility and Fuels Strategy (project ongoing by PTV, Fraunhofer-ISI, and M-Five).

Preliminary results indicate that only under regulated conditions (i.e. the obligation for pooling) positive climate impacts can be expected. The Association of German Transport Companies (VDV, 2017) goes a step further and postulates a complete change of public transport organization in the future: without integrating MaaS services in their business portfolio, the sector may shrink to providing high capacity services on a strongly limited core network.

6. What decision makers need to think about

Based on barriers and drivers mentioned in section 3 and 4, it is believed that the successful rollout of MaaS is highly dependent on many stakeholders. Among those, primarily the national and local authorities have a larger role at the initiation phases. Here we outline some food-for-thought and action points for this type of decision makers:

- How to prepare the market (also current transportation operators) for the rollout of MaaS while protecting the public interest (Lund et al., 2017) and providing sustainable public transport (Westermann, 2018)
- How to moderate the “MaaS eco system” (Datson, 2016), where several stakeholders are present, namely: users/customers, public/private transport providers, policy makers and regulators, software providers, local authorities, telecommunication providers etc.
- How to be open to all providers. This maybe include local small to medium entities or international giants, such as technology providers (e.g. Google) and telecommunication companies. Finally, how to consolidate them under one umbrella of MaaS
- How to maintain a level playing field for all participants
- What regulations are needed and to what extent the market should be left to evolve freely.
- When working with private sector:
- How to align goals
- How to develop trust
- How to deal with areas where goals are not aligned and preventing cities from being ‘flooded by unwanted initiatives’ (Lund et al., 2017).
- How to manage transitions and unknown end states
- What impacts will all of this have on society and beyond simply transportation (Lund et al., 2017)

To maximize the societal benefits of MaaS, we recommend policy makers to setup open ended MaaS platforms to allow multiple parties to join in. Meanwhile, they must apply some leverage to prioritize public transport and bike sharing to reach the most optimal urban mobility targets from emission and concession perspective.

7. Conclusion

In this paper, we focus on the new mobility services from the transport policy perspective. We put together relevant drivers and barriers of MaaS and new mobility services, in the highly regulated EU market. We listed these factors based on over 15 extensive interviews with experts from public and private parties and based on the in-house knowledge developed at transportation departments of two independent research institutes: TNO in the Netherlands and Fraunhofer ISI in Germany.

Two national case studies have been discussed, where the mentioned drivers and barriers are reflected. Furthermore, we have updated an up to date list of MaaS example within the EU, as reference for researchers and practitioners.

The examples of both the Netherlands and Germany illustrate the strong role of regulation in the further development of the MaaS landscape. At this point in time, it is uncertain how this process will evolve and what the societal outcomes will be. What can be learned from this paper is that due to many drivers and barriers for MaaS, there are still ample opportunities to manage the outcomes proactively. Yet this requires leadership, willingness and drive from both public and private sector to cooperate and to achieve long-term objectives.

Furthermore, the large-scale implementation and deployment of MaaS requires an integral strategy, monitoring and management. This strategy must include how public and private parties are going to cooperate in the realization of MaaS platforms. This holds for the process itself as well as the impacts of MaaS and stretches further towards an adaptive governance to deal with uncertainties and unforeseen consequences in a nimble and flexible way.

Finally, our study recommends the policy makers to use take the opportunity to develop an open and public based MaaS platform. Within this platform they can prioritize public transport and active modes in highly utilized areas and allow (or even encourage) private mobility providers to serve less dense urban areas.

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